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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/009,504	03/28/2002	Garry Royston Fish	10541-824	5011

7590 06/17/2003

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EXAMINER

FLANIGAN, ALLEN J

ART UNIT	PAPER NUMBER
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3743

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DATE MAILED: 06/17/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/009,504

Applicant(s)

FISH, GARRY ROYSTON

Examiner

Allen J. Flanigan

Art Unit

3743

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-24 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

The numbering of claims is not in accordance with 37 CFR 1.126 which requires the original numbering of the claims to be preserved throughout the prosecution. When claims are canceled, the remaining claims must not be renumbered. When new claims are presented, they must be numbered consecutively beginning with the number next following the highest numbered claims previously presented (whether entered or not).

Misnumbered claims 16-25 have been renumbered 15-24.

Claim 14 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The recitation in claim 14 that "laminar flow is maintained within the tube *over the normal operating range of the heat exchanger*" is indefinite and also misleading. No guidance is given in the specification regarding what values or even what variables constitute the "normal range" of a heat exchanger. Heat exchangers are used in such a wide variety of applications with varying fluid densities, temperatures, flow rates, and pressures, that it would be impossible to define a "normal range" of such values with any meaningful degree of specificity. Further, the implication that "laminar flow is maintained" despite the presence of flow diverting protrusions is misleading. Mixing requires some diversion from laminar (layered) flow; the macroscopic transport of fluid away from

the surface that enhances heat transfer efficiency requires disruption of laminar flow. As applicants admit on p. 7, what will actually occur is that laminar flow is disrupted to generate mixing, and then "resumes" if sufficient space is provided between disrupting elements.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-5, 9, 12, 13, 15-17, 21, and 24 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Kiser et al.

The disclosure of Kiser et al. shows dimples spaced well apart from each other, which project up to 50% of the way into the tube passage. It would appear from the drawings and the disclosed ranges of preferred spacing (.375 inches laterally in tubes from 1-3 inches wide, at least 1 inch apart longitudinally to avoid undue pressure drop over the length of

the tube, see bridging paragraph columns 4-5) that the tubing taught in Kiser et al. exhibits values for dimple area which fall within the claimed ranges. Even assuming *arguendo* that this is not the case, as noted above, it is well understood in the art that providing flow disrupting elements such as internal dimples requires a balance between enhanced mixing or turbulence to reduce boundary layer thickness, and avoiding undue pressure drop which increases pumping costs. Thus, it would have been obvious to one of ordinary skill in the art at the time the instant invention was made to optimize the parameters of the dimples taught in Kiser et al. (size, height, spacing, etc.) to properly balance these conflicting aspects in a given application.

Claims 6-8, 10, 11, 18-20, 22, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combined teachings of Kiser et al. and Rhodes.

Rhodes teaches the equivalence of round dimples such as those used in Kiser et al. with rectangular dimples, and also expressly teaches alternative arrangements of transverse rows of indentations with diagonally aligned rows (Figs. 7E, 7F). Thus, it would have been obvious to one of ordinary skill in the art at the time the instant invention was made in view of these express teachings of equivalency to employ the rectangular indentations of Rhodes in place of the circular ones of Kiser et al., or to align the indentations diagonally instead of transversely. Alternately, it would have been obvious to one of ordinary skill in the art

at the time the instant invention was made in view of the teachings of Kiser et al. to space the indentations taught in Rhodes far enough apart to ensure that they do not generate undue pressure drop while still enhancing heat transfer efficiency.

Regarding claims 8 and 21, note Fig. 5 of Rhodes and Fig. 7 of Kiser et al.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Bossart et al. discloses an early version of flow deflecting indentations in tube walls. Randlett et al. specifically discuss turbulence and pressure drop caused by indentations within a tube.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Allen J. Flanigan whose telephone number is (703) 308-1015. The examiner can normally be reached on M-F 9:00-5:30.

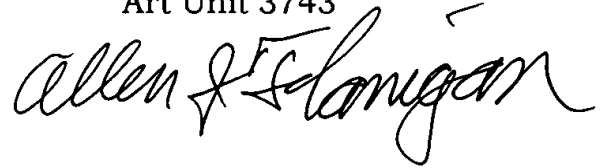
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Henry Bennett can be reached on (703) 308-0101. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7764 for regular communications and (703) 305-3463 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0861.

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Allen J. Flanigan
Primary Examiner
Art Unit 3743

A handwritten signature in black ink that reads "allen j. Flanigan". The signature is written in a cursive style with a large, stylized "F" and a long, sweeping underline.

AJF
June 12, 2003